TPC-1770/1780

Intel Touch Panel Computer with High Luminance 17" SXGA TFT LCD

User Manual

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Product Warranty (2 years)

Advantech warrants to you, the original purchaser, that each of its products will be free from defects in materials and workmanship for two years from the date of purchase.

This warranty does not apply to any products which have been repaired or altered by persons other than repair personnel authorized by Advantech, or which have been subject to misuse, abuse, accident or improper installation. Advantech assumes no liability under the terms of this warranty as a consequence of such events.

Because of Advantech's high quality-control standards and rigorous testing, most of our customers never need to use our repair service. If an Advantech product is defective, it will be repaired or replaced at no charge during the warranty period. For out-of-warranty repairs, you will be billed according to the cost of replacement materials, service time and freight. Please consult your dealer for more details.

If you think you have a defective product, follow these steps:

1. Collect all the information about the problem encountered. (For example, CPU speed, Advantech products used, other hardware and software used, etc.) Note anything abnormal and list any onscreen messages you get when the problem occurs.
2. Call your dealer and describe the problem. Please have your manual, product, and any helpful information readily available.
3. If your product is diagnosed as defective, obtain an RMA (return merchandize authorization) number from your dealer. This allows us to process your return more quickly.
4. Carefully pack the defective product, a fully-completed Repair and Replacement Order Card and a photocopy proof of purchase date (such as your sales receipt) in a shippable container. A product returned without proof of the purchase date is not eligible for warranty service.
5. Write the RMA number visibly on the outside of the package and ship it prepaid to your dealer.

Declaration of Conformity

CE

This product has passed the CE test for environmental specifications when shielded cables are used for external wiring. We recommend the use of shielded cables. This kind of cable is available from Advantech. Please contact your local supplier for ordering information.

FCC Class A

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Technical Support and Assistance

Step 1. Visit the Advantech web site at **www.advantech.com/support** where you can find the latest information about the product.

Step 2. Contact your distributor, sales representative, or Advantech's customer service center for technical support if you need additional assistance. Please have the following information ready before you call:
- Product name and serial number
- Description of your peripheral attachments
- Description of your software (operating system, version, application software, etc.)
- A complete description of the problem
- The exact wording of any error messages

Safety Instructions

1. Read these safety instructions carefully.
2. Keep this User's Manual for later reference.
3. Disconnect this equipment from any AC outlet before cleaning. Use a damp cloth. Do not use liquid or spray detergents for cleaning.
4. For plug-in equipment, the power outlet socket must be located near the equipment and must be easily accessible.
5. Keep this equipment away from humidity.
6. Put this equipment on a reliable surface during installation. Dropping it or letting it fall may cause damage.
7. The openings on the enclosure are for air convection. Protect the equipment from overheating. DO NOT COVER THE OPENINGS.
8. Make sure the voltage of the power source is correct before connecting the equipment to the power outlet.
9. Position the power cord so that people cannot step on it. Do not place anything over the power cord.
10. All cautions and warnings on the equipment should be noted.
11. If the equipment is not used for a long time, disconnect it from the power source to avoid damage by transient overvoltage.
12. Never pour any liquid into an opening. This may cause fire or electrical shock.
13. Never open the equipment. For safety reasons, the equipment should be opened only by qualified service personnel.
14. If one of the following situations arises, get the equipment checked by service personnel:

a. The power cord or plug is damaged.

b. Liquid has penetrated into the equipment.

c. The equipment has been exposed to moisture.

d. The equipment does not work well, or you cannot get it to work according to the user's manual.

e. The equipment has been dropped and damaged.

f. The equipment has obvious signs of breakage.

15. DO NOT LEAVE THIS EQUIPMENT IN AN ENVIRONMENT WHERE THE STORAGE TEMPERATURE MAY GO BELOW -

20° C (-4° F) OR ABOVE 60° C (140° F). THIS COULD DAMAGE THE EQUIPMENT. THE EQUIPMENT SHOULD BE IN A CONTROLLED ENVIRONMENT.

16. CAUTION: DANGER OF EXPLOSION IF BATTERY IS INCORRECTLY REPLACED. REPLACE ONLY WITH THE SAME OR EQUIVALENT TYPE RECOMMENDED BY THE MANUFACTURER, DISCARD USED BATTERIES ACCORDING TO THE MANUFACTURER'S INSTRUCTIONS.

The sound pressure level at the operator's position according to IEC 704-1:1982 is no more than 70 dB (A).

DISCLAIMER: This set of instructions is given according to IEC 704-1. Advantech disclaims all responsibility for the accuracy of any statements contained herein.

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CHAPTER 1

General Information

Sections include:

- Introduction
- Specifications
- LCD Specifications
- Touchscreen Specifications
- Power
- I/O Ports Arrangement
- Panel Mounting
- Dimensions & Cutout

Chapter 1 General Information

1.1 Introduction

The TPC-1770/1780 TPC is state-of-the-art HMI. This 17" display operator interface is an x86-based platform with these key features:

Fanless:
By using a low power processor, the system does not have to rely on fans, which are unreliable, and cause dust to circulate inside the equipment.

Bright Display:
The bright TFT LCD display suits industrial demands for clear interfaces.

Powerful Communication Capability:
The TPC-1770/1780 provides powerful IO interface for easily communicating with other devices. The IO interface includes serial ports, Ethernet and USB 2.0 support.

Embedded Windows Support:
In addition to the OS support of Windows XP, Advantech offers platform support for XP embedded.

1.2 Specifications

1.2.1 System Kernel

Item	TPC-1770H	TPC-1780H
CPU	Intel® Celeron M 1GHz w/ 0 L2 cache	Intel® Core 2 Duo L7400 1.5GHz w/ 4M L2 cache
BIOS	Award 4MB	Award 4MB
North Bridge	915GME	945GME
South Bridge	ICH6M	ICH7M-DH
Memory	DIMM 240pin DDR2 400MHz, Single Channel, Default 512MB, Up to 2G	SO-DIMM 200pin DDR2 533MHz, Dual Channel, Default 512MB x 2, Up to 4G
Storage	CF Card Slot x 1 (TYPE Ⅱ)	CF Card Slot x 1 (TYPE Ⅱ)
	2.5" SATA x 1	2.5" SATA x 1
Watchdog timer	Super I/O SMSC SCH3114, Interval 1sec	Super I/O SMSC SCH3114, Interval 1sec

1.2.2 I/O Ports

Item	TPC-1770H	TPC-1780H
I/O port	10/100/1000 Base-T x 2, (Realtek RTK8111B)	10/100/1000 Base-T x 2, (Realtek RTK8111B)
	RS-232 x 3 (COM1, COM3, COM4)	RS-232 x 3 (COM1, COM3, COM4)
	VGA x 1	VGA x 1
	USB 2.0 x 4	USB 2.0 x 4
	PS/2 Mouse interface x 1	PS/2 Mouse interface x 1
	PS/2 Keyboard interface x 1	PS/2 Keyboard interface x 1
	Mic-in, Line-in, Line-out (AC97)	Mic-in, Line-in, Line-out (AC97)
Expansion Bus	PCI PCI-E x1 2ports SDVO LPC USB 2ports SMBUS GPIO Support: NO SerIRQ: Yes	PCI PCI-E x1 4ports SDVO LPC USB 2ports SMBUS GPIO Support: 2 SerIRQ: Yes

1.2.3 Safety and Environment

Safety

FCC Class A and CE certified

BSMI certified

UL certified

The front bezel is compliant with NEMA 4

Environment

Operating Temperature: 0~45° C

Storage Temperature: -20~70° C

Humidity: 10~95% @ 40 relative humidity (non-condensing)

Vibration: 1Grms (5~500Hz)

1.3 LCD Specifications

Display Type	TFT color LCD
Size (diagonal)	17”
Maximum Resolution	1280 x 1024 (SXGA)
Maximum colors	16.7M colors (RGB 6-bit + FRC data)
Pixel Pitch (W x H)	0.264 x 0.264 mm
Viewing Angle	160° (H), 160° (V); CR>=10
Luminance (cd / m^2)	300
Contrast Ratio	800:1
Operating Temperature	0~50° C (Ambient)
Backlight	4 CCFL
Backlight Life Time	50,000 hours

Note	*There might be several bright or dark pixels on the LCD. This comes from the production of the LCD. Such phenomenon is claimed to be normal according to the LCD manufacturers.*

1.4 Touchscreen Specifications

Touchscreen Type	Resistive
Base Glass Construction	Tempered Glass
Resolution	1024 x 1024
Light Transmission	80% typical
Controller	USB Interface
Power Rating	3.3 to 5V
Durability	1 million touches

1.5 Power

Input voltage: 18 ~ 32 Vdc, 5.55-3.12A Max (the fuse will be open circuit as input level exceeds 33Vdc)

1.6 I/O Port Arrangement

The arrangement of the I/O ports is shown in Figure 1.1.

Figure 1.1: I/O Port Arrangement

1.7 Panel Mounting

1. There is a piece of adhesive waterproof gasket on the AL front bezel. Make sure the waterproof gasket is in position before installing the TPC-1770/1780 to the panel opening.
2. Install the TPC-1770/1780 to the panel opening.
3. Find out the ten clampers and ten long screws in the accessory pack. Hook those clampers to those holes around the four sides of the bezel. Insert the screws to every clamper and fasten them. These screws will then push on the mounting panel and fix the unit.
4. The mounting panel thickness is suggested to be less than 5.5mm (0.216 inch).

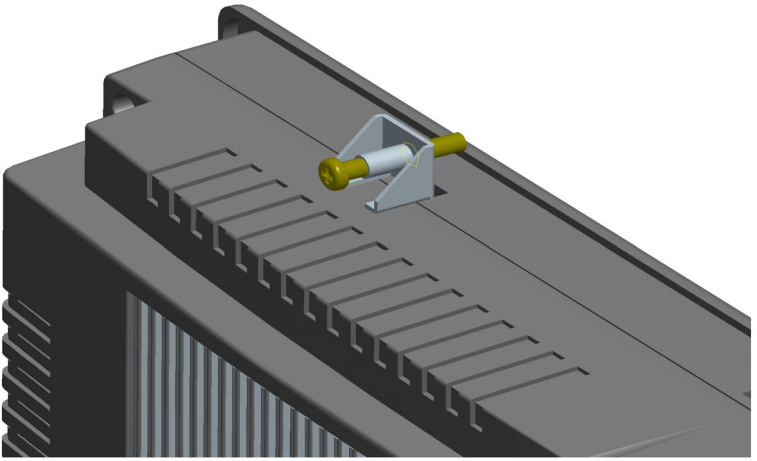


Figure 1.2: Panel Mounting

1.8 Dimensions & Cutout

Weight: 8 Kg (without HDD)

Dimensions: 414 x 347.5 x 93 mm (16.3" x 13.68" x 3.66") (WxHxD)

Cutout: 400.8 x 334.3 mm (suggested)

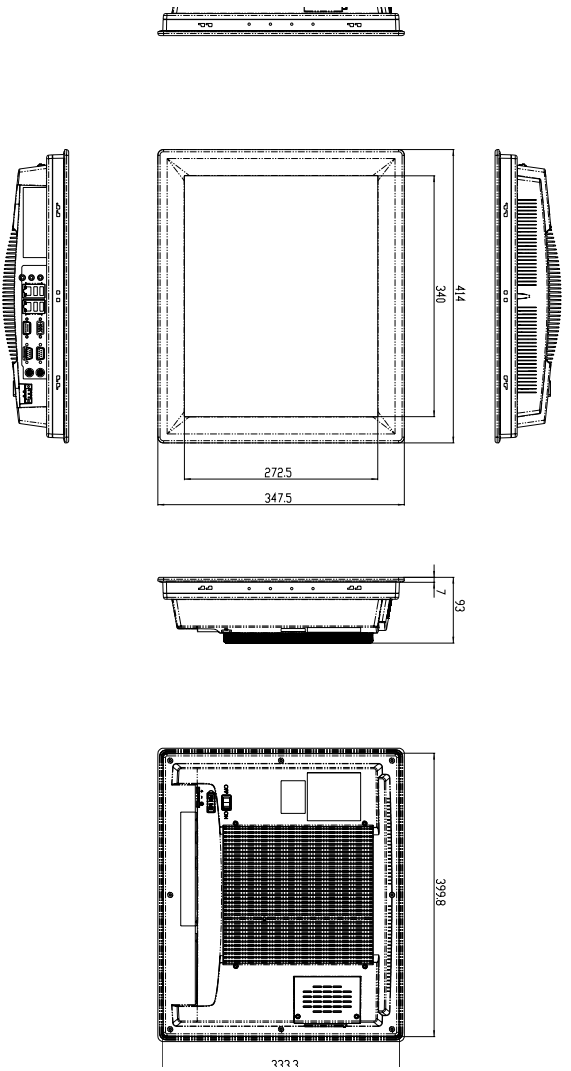


Figure 1.3: Dimensions

CHAPTER 2

System Setup

Chapter 2 System Setup

This chapter provides a brief explanation for operating the TPC-1770/1780. It is easy to make the TPC-1770/1780 start working with the below step-by-step.

Step 1: Unpack the TPC-1770/1780 package. Please check the packing list at the beginning of this manual.

Step 2: Install a CompactFlash containing Windows XP Embedded or other operating system.

Figure 2.1: Install CompactFlash memory card

Warning	*It is suggested to turn OFF system power as plug in or pull out the memory card, though the Compact-Flash memory is supposed to be hot swappable.*

Step 3: Connect the power connector to the 24VDC power lines. The power lines can either be of some power adapter or in-house power source.

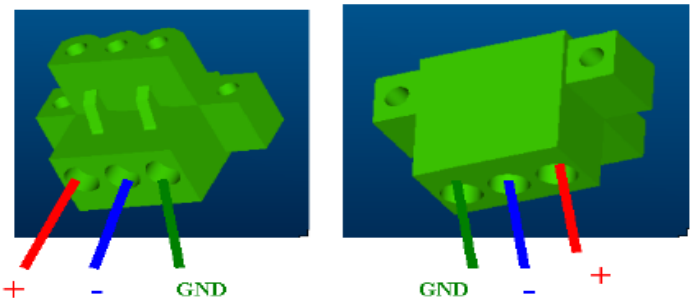


Figure 2.2: Power connector

Figure 2.3: Power Receptor

Step 4: Plug the power lines to the system power receptor.

Step 5: Push the power button to power on the system as the figure 2.4.

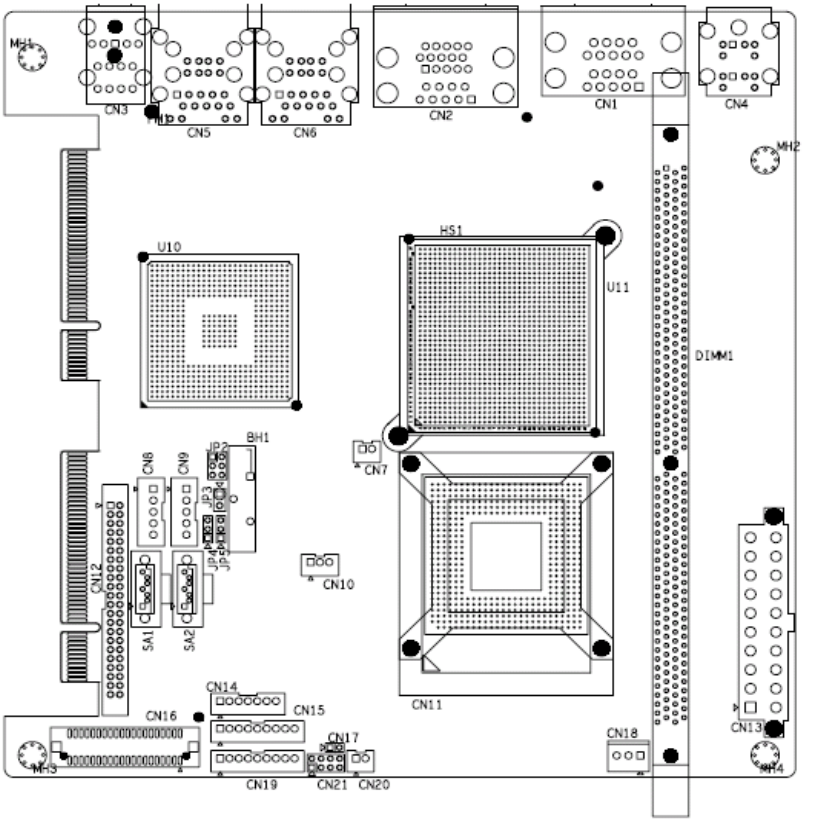
Figure 2.4: Power Button

CHAPTER 3

I/O Connectors & Setting Mode

Chapter 3 I/O Connector & Setting Mode

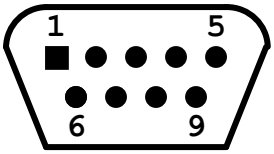
3.1 TPC-1770



CN1A	COM3	RS-232 COM 3
CN1B	COM4	RS-232 COM4
CN2A	COM1	RS-232 COM1
CN2B	VGA port	Connector to VGA output
CN3	Audio Jack	Connector to Audio
CN4	PS/2 KB/MS	PS/2 connector for KB/MS
CN5A	LAN1	RTL8111B
CN5B, CN5C	USB1, USB2	USB port
CN6A	LAN2	RTL8111B
CN6B, CN6C	USB3, USB4	USB port
CN8	USB 5	USB optional port
CN9	USB 6	USB optional port
CN12	IDE Connector	2.5î IDE connector
CN13	ATX Connector	ATX power input
CN14	Inverter connector	Inverter power output
CN15	Touch connector	Connector Touch sensor
CN16	LVDS Connector	Connector LVDS panel
CN18	FAN connector	Connect CPU FAN
CN19	PANSWIN	Connector PW01
SA1	SATA Connector	SATA connector 1
SA2	SATA Connector	SATA connector 2
JP2	LCD resolution	LCD resolution selection
JP3	CMOS clear	Clear CMOS

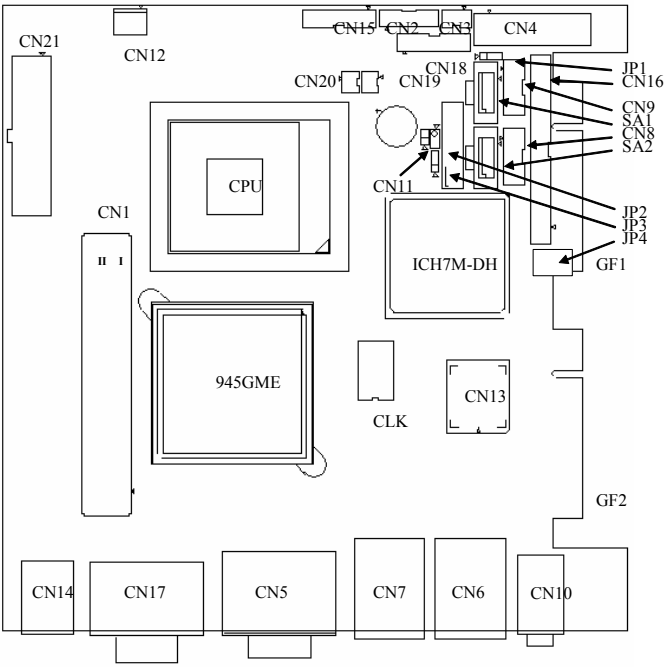
3.1.1 CN1 (COM3, COM4), CN2A (COM1)

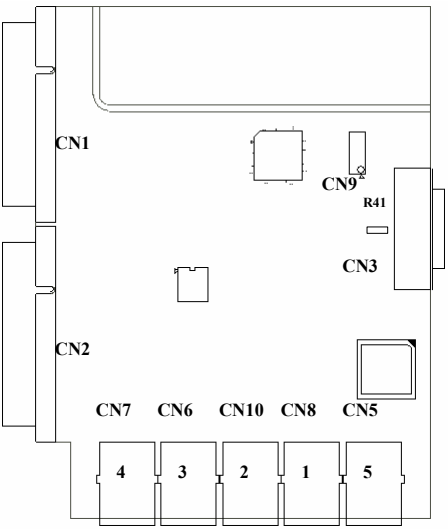
Serial Port RS232 Connector Definitions



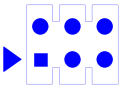
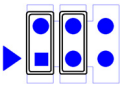
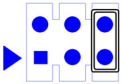
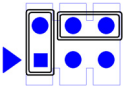
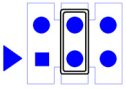
PIN	RS-232
1	NDCD
2	NRX
3	NTX
4	NDTR
5	GND
6	NDSR
7	NRTS
8	NCTS
9	NRI

3.1.2 TPC-1780


CN21
CN12
CN15
CN2
CN3
CN4
CN18
CN20
CN19
JP1
CN16
CN9
SA1
CN8
SA2
CPU
CN11
CN1
JP2
JP3
JP4
ICH7M-DH
GF1
945GME
CLK
CN13
GF2
CN14
CN17
CN5
CN7
CN6
CN10

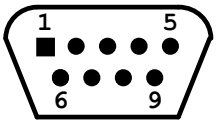

CN1
CN9
R41
CN3
CN2
CN7
CN6
CN10
CN8
CN5
4
3
2
1
5

CON. #	Function	Description
CN1	DDR2 SO-DIM*2	Up to 4GB
CN2	INVERTER	TDK TBD266LR-1
CN3	INVERTER VRCtrl	Control inverter brightness by Digital VR DS1804
CN4	LVDS	Dual channels LVDS
CN5	VGA + COM1	VGA + Full DB9 Serial Port COM1
CN6	LAN1 + USB*2	10/100/1000MB Ethernet LAN1 + USB*2
CN7	LAN2 + USB*2	10/100/1000MB Ethernet LAN2 + USB*2
CN8	USB	Inside USB port 1
CN9	USB	Inside USB port 2
CN10	AUDIO	Line-out / Line-in / MIC by ALC650
CN11	BUZZER SELECT	Select internal or external buzzer
CN12	CPU FAN	CPU fan, work @ 12V
CN13	FWH	BIOS FWH, Flash P/N 46LF004B
CN14	PS/2 KB + MS	PS/2 keyboard & mouse
CN15	TOUCH PANEL	8-wired touch panel sensor signals
CN16	IDE	Secondary IDE, Internal IDE 44pin(2mm) connector
CN17	COM3 + COM4	Full DB9 Serial Port COM3 & COM4
CN18	BOOT Ctrl	Receive external push-button signal / reset / HDDLED
CN19	SNMP I2C BUS	I2C bus for SNMP measure, WINBOND W83782G
CN20	BUZZER OUTPUT	External buzzer output, depend on CN11
CN21	ATX Power-input	Standard ATX Power input
SA1	SATA1	Primary IDE, Master
SA2	SATA2	Primary IDE, Slave
JP1	LVDS PWR Select	For 5V Panel: 1-2 (default) , For 3.3V panel: 2-3
JP2	CLEAR CMOS	Normal: open (default) , Clear CMOS: short
JP3	BATTERY Verify	Normal: 1-2 (default) , just for battery current measure

JP4	LVDS PANEL Sel.	1024 * 768 24bit (Default)  800 * 600 24bit  **VGA only** 	1280 * 1024 48bit  1600*1200 48bit 

3.1.3 COM1,COM3,COM4 : Serial port RS232

Connector Definitions



Pin	Signal
1	NDCD
2	NRX
3	NTX
4	NDTR
5	GND
6	NDSR
7	NRTS
8	NCTS
9	NRI

CHAPTER 4

Software Configuration

Sections include:

- Utilities & Drivers

Chapter 4 Software Configuration

A support CD-ROM for TPC-1770/1780 is available and along with the product. There are related utilities and drivers for TPC-1770/1780 included. Please install the Chipset INF driver, VGA graphics driver, LAN driver, audio driver, Advantech.com driver, Touchscreen driver and Watchdog Timer (WDT) driver sequentially.

4.1 Utilities & Drivers

The following utilities and drivers are provided for TPC-1770/1780. You can also find the updated utilities and drivers from the support website.

4.1.1 Intel Chipset Software Installation Utility

Path: \TPC-1770H\XP\Chipset

\TPC-1780H\XP\Chipset

\TPC-1780H\VISTA32\Chipset

\TPC-1780H\VISTA64\Chipset

Available for the OS's below:

- Microsoft Windows XP
- Microsoft Vista

4.1.2 VGA Drivers (Intel(R) Graphics Driver)

Path: \TPC-1770H\XP\VGA

\TPC-1780H\XP\VGA

\TPC-1780H\VISTA32\VGA

\TPC-1780H\VISTA64\VGA

Available for the OS's below:

- Microsoft Windows XP
- Microsoft Vista

4.1.3 LAN Driver

Path: \TPC-1770H\XP\LAN

\TPC-1780H\XP\LAN

\TPC-1780H\VISTA32\LAN

\TPC-1780H\VISTA64\LAN

Available for the OS's below:

- Microsoft Windows XP
- Microsoft Vista

4.1.4 Touchscreen Driver

Path: \TPC-1770H\XP\TouchScreen

\TPC-1780H\XP\TouchScreen

\TPC-1780H\VISTA32\TouchScreen

\TPC-1780H\VISTA64\TouchScreen

Available for the OS's below:

- Microsoft Windows XP
- Microsoft Vista

4.1.5 Audio Driver

Path: \TPC-1770H\XP\Audio

\TPC-1780H\XP\Audio

\TPC-1780H\VISTA32\Audio

\TPC-1780H\VISTA64\Audio

Available for the OS's below:

- Microsoft Windows XP
- Microsoft Vista

CHAPTER 5

Windows XP Embedded

Sections include:

- EWF
- HORM
- Advantech Utilities

Chapter 5 Windows XP Embedded

TPC-1770/1780 is in support of embedded windows platform. This section is to state the important features, EWF and HORN, provided in windows XP embedded.

5.1 EWF

EWF stands for Enhanced Write Filter. It provides an upper filter in the storage device driver stack that redirects disk write operations to volatile (RAM) or non-volatile (disk) storage. EWF protects a volume from write access. The benefits are as the following.

Write-protect one or more partitions on your system.

Enable read-only media, such as CD-ROM or flash, to boot and run.

Prolong the lifespan of write-sensitive storage, such as CompactFlash.

TPC-1770/1780 XPE provides EWF RAM RDG mode on system partition. All wirte to system partition will be redirected to RAM once this mode is enabled. This mode is manually enabled by customers after they finish all their changes on system such as installing their applications or adjusting system setting.

Advantech provides a pair of utilities to operate EWF, OSLock and OSUnLock. The setting is stated in the section later.

5.2 HORM

HORM stands for Hibernate Once Resume Many. In HORM environment, a single hibernation file is used to boot the system repeatedly. To set a HORM environment, please follow the steps below.

Please make sure EWF is disabled. You can run OSUnLock to disable EWF.

Enable hibernation support:
Run ‘power options’ in control panel, and then select ‘Enable Hibernation’ in hibernation pane.

Enable EWF:
Run OSLock, and then system reboot automatically.

Open those software that customers want to directly use after system resume from hibernation.

Hibernate via Advantech HORM utility:
Please Click Start Menu->All Programs->Advantech->HORM

HORM environment remains all along unless the following events occur:

Run EWF commit command (ewfmgr c: -commit) and then reboot.

Select “Discard hibernation file” by clicking F8 when system is starting

Also, HORM cannot fit your system if free space in C partition is not enough. The hibernation file required is dependent on the RAM size you use on the system. In other words, the hibernation file is 512MB that is the same as memory size used on TPC-1770/1780.

5.3 Advantech Utilities

5.3.1 Version Information

Start menu-> All Programs -> Advantech

This states the current XPE runtime information including hardware platform, version, build number, release date, XPE QFEs installed in component database and XP Pro Patches you installed manually.

5.3.2 EWF Enable and Disable

The two utilities assist users to enable or disable EWF. Please go to Start Menu-> All Programs-> Advantech. The default setting of EWF is disabled. Users can protect C partition from any disk writing via OSLock that is to enable EWF RAM REG Mode. In this mode, any changes on C partition including modification on files or registry will be redirected to memory, thus these changes will be discarded in the next system startup.

To exit this environment is via OSUnLock. Please visit MSDN website for further information about EWF.

5.3.3 HORM

This is to create HORM environment. Please go to Start Menu-> All Programs-> Advantech. This utility firstly dismounts all local physical volumes that are not protected by EWF. It requires users to input the volume list.

Please follow the steps before running this utility to create full HORM environment.

Enable Hibernation via Power Options in Control Panel

Make C: partition EWF-enabled via OSLock

Make sure that all volumes to be dismounted are not in use.

APPENDIX A

Watchdog Timer Programming

Appendix A WDT Programming

A.1 Overview

The TPC-1770/1780 cards' watchdog timer can be used to monitor system software operation and take corrective action if the software fails to function after the programmed period. This section describes the operation of the watchdog timer, and how to program it.

The watchdog timer is built into the super I/O controller SMSC SCH3114. It provides the following functions for user programming:

- Can be enabled and disabled by user's program.
- Timer can be set from 1 to 255 seconds or 1 to 255 minutes.
- Generates an interrupt or resets signal if the software fails to reset the timer after time-out.

A.2 Watchdog Timer Programming

The I/O port address of the watchdog timer is 2E(hex) and 2F(hex), 2E (hex) is the address port. 2F(hex) is the data port. You must first assign the address of register by writing address value into address port 2E(hex), then write/read data to/from the assigned register through data port 2F (hex).

Table A.1: Watchdog Runtime Registers

Name	REG OFFSET (HEX)	DESCRIPTION
WDT_TIME_OUT	65	Watch-dog Timeout Bits[6:0] Reserved Bit[7] WDT Time-out Value Units Select = 0 Minutes = 1 Seconds
WDT_VAL	66	Watch-dog Timer Time-out Value Binary coded, units = minutes or seconds, selectable via Bit[7] of WDT_TIME_OUT register (0x65). 0x00 Time out disabled 0x01 Time-out = 1 minute (second) ….. 0xFF Time-out = 255 minutes (seconds)
WDT_CFG	67	Bit[0] Reserved Bit[1] Keyboard Enable =1 WDT is reset upon a Keyboard interrupt. =0 WDT is not affected by Keyboard interrupts. Bit[2] Mouse Enable =1 WDT is reset upon a Mouse interrupt. =0 WDT is not affected by Mouse interrupts. Bit[7:3] Reserved
WDT_CTRL	68	Bit[1] Reserved Bit[2] Force Timeout, =1 Forces WD timeout event; this bit is self-clearing Bit[7:3] Reserved

A.3 Example Programs

1. Enable watchdog timer and set 10 seconds of timeout interval

```
;----------------------------
; enter configuration state
;----------------------------
mov    dx, 2Eh
mov    al, 55h
out    dx, al

;----------------------------
; select watchdog registers
;----------------------------
mov    al, 7
mov    dx, 2Eh
out    dx, al
mov    dx, 2Fh
mov    al, 0ah
out    dx, al

;----------------------------
; get base address
;----------------------------
mov    al, 60h
mov    dx, 2Eh
out    dx, al
mov    dx, 2Fh
in     al, dx
mov    ah, al

mov    al, 61h
```

```
mov    dx, 2Eh
out    dx, al
mov    dx, 2Fh
in     al, dx

; now, AX contains the base address

mov    bx, ax  ; save base address in BX

;----------------------------
; exit configuration state
;----------------------------
mov    dx, 2Eh
mov    al, 0AAh
out    dx, al

;----------------------------
; select WDT pin
;----------------------------
mov    dx, bx
add    dx, 47h
mov    al, 0Ch
out    dx, al

;----------------------------
; select WDT timeout unit
;----------------------------
mov    dx, bx
add    dx, 65h
mov    al, 80h          ; second
out    dx, al
```

```
;----------------------------
; select WDT timeout value
;----------------------------
mov    dx, bx
add    dx, 66h
mov    al, 10          ; 10 seconds
out    dx, al
```

2. Enable watchdog timer and set 5 minutes of timeout interval

```
;----------------------------
; enter configuration state
;----------------------------
mov    dx, 2Eh
mov    al, 55h
out    dx, al

;----------------------------
; select watchdog registers
;----------------------------
mov    al, 7
mov    dx, 2Eh
out    dx, al
mov    dx, 2Fh
mov    al, 0ah
out    dx, al

;----------------------------
; get base address
;----------------------------
mov    al, 60h
```

```
mov    dx, 2Eh
out    dx, al
mov    dx, 2Fh
in     al, dx
mov    ah, al

mov    al, 61h
mov    dx, 2Eh
out    dx, al
mov    dx, 2Fh
in     al, dx

; now, AX contains the base address

mov    bx, ax  ; save base address in BX

;----------------------------
; exit configuration state
;----------------------------
mov    dx, 2Eh
mov    al, 0AAh
out    dx, al

;----------------------------
; select WDT pin
;----------------------------
mov    dx, bx
add    dx, 47h
mov    al, 0Ch
out    dx, al
```

```
;----------------------------
; select WDT timeout unit
;----------------------------
mov    dx, bx
add    dx, 65h
mov    al, 00h          ; minute
out    dx, al

;----------------------------
; select WDT timeout value
;----------------------------
mov    dx, bx
add    dx, 66h
mov    al, 5            ; 5 minutes
out    dx, al
```

3. Enable watchdog timer to be reset upon mouse interrupt

(Note: WDT timeout value must be set before this function can work)

```
;----------------------------
; enter configuration state
;----------------------------
mov    dx, 2Eh
mov    al, 55h
out    dx, al

;----------------------------
; select watchdog registers
;----------------------------
mov    al, 7
mov    dx, 2Eh
```

```
out     dx, al
mov     dx, 2Fh
mov     al, 0ah
out     dx, al

;----------------------------
; get base address
;----------------------------
mov     al, 60h
mov     dx, 2Eh
out     dx, al
mov     dx, 2Fh
in      al, dx
shl     al, 8

mov     al, 61h
mov     dx, 2Eh
out     dx, al
mov     dx, 2Fh
in      al, dx

; now, AX contains the base address

mov     bx, ax  ; save base address in BX

;----------------------------
; exit configuration state
;----------------------------
mov     dx, 2Eh
mov     al, 0AAh
out     dx, al
```

```
;----------------------------
; select WDT configuration
;----------------------------
mov    dx, bx
add    dx, 67h
in     al, dx
or     al, 04h          ; reset upon mouse interrupt
out    dx, al
```

4. Enable watchdog timer to be reset upon keyboard interrupt

(Note: WDT timeout value must be set before this function can work)

```
;----------------------------
; enter configuration state
;----------------------------
mov    dx, 2Eh
mov    al, 55h
out    dx, al

;----------------------------
; select watchdog registers
;----------------------------
mov    al, 7
mov    dx, 2Eh
out    dx, al
mov    dx, 2Fh
mov    al, 0ah
out    dx, al

;----------------------------
; get base address
```

```
;----------------------------
mov    al, 60h
mov    dx, 2Eh
out    dx, al
mov    dx, 2Fh
in     al, dx
shl    al, 8

mov    al, 61h
mov    dx, 2Eh
out    dx, al
mov    dx, 2Fh
in     al, dx

; now, AX contains the base address

mov    bx, ax  ; save base address in BX

;----------------------------
; exit configuration state
;----------------------------
mov    dx, 2Eh
mov    al, 0AAh
out    dx, al

;----------------------------
; select WDT configuration
;----------------------------
mov    dx, bx
add    dx, 67h
in     al, dx
```

```
or      al, 02h         ; reset upon keyboard interrupt
out     dx, al
```

5. Force timeout

(Note: WDT timeout value must be set before this function can work)

```
;----------------------------
; enter configuration state
;----------------------------
mov    dx, 2Eh
mov    al, 55h
out     dx, al

;----------------------------
; select watchdog registers
;----------------------------
mov    al, 7
mov    dx, 2Eh
out     dx, al
mov    dx, 2Fh
mov    al, 0ah
out     dx, al

;----------------------------
; get base address
;----------------------------
mov    al, 60h
mov    dx, 2Eh
out     dx, al
mov    dx, 2Fh
in      al, dx
```

```
shl     al, 8

mov     al, 61h
mov     dx, 2Eh
out     dx, al
mov     dx, 2Fh
in      al, dx

; now, AX contains the base address

mov     bx, ax  ; save base address in BX

;----------------------------
; exit configuration state
;----------------------------
mov     dx, 2Eh
mov     al, 0AAh
out     dx, al

;----------------------------
; Force timeout
;----------------------------
mov     dx, bx
add     dx, 68h
in      al, dx
or      al, 04h         ; force timeout
out     dx, al
```

APPENDIX B

HDD Kit Assembly

Appendix B HDD Kit Assembly

Please follow the assembly procedure to install the HDD into the system.

1. Remove the rear HDD cover.

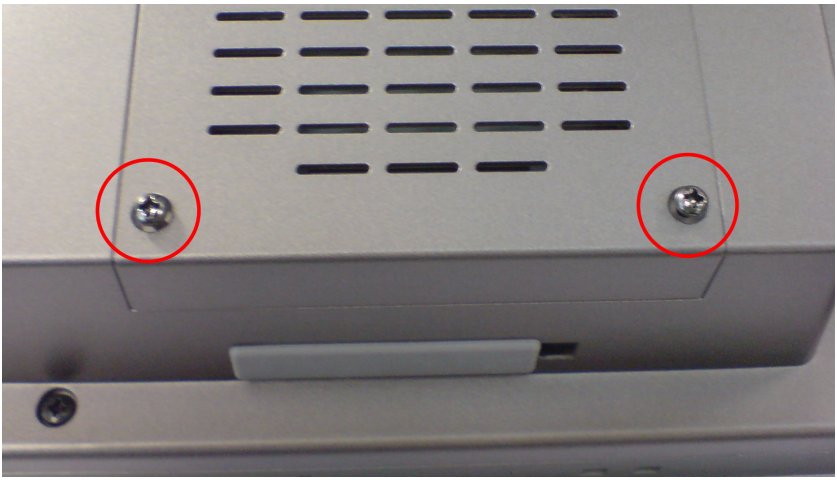


Figure B.1: Removing the Rear HDD Cover

2. Deassemble the HDD kit from the system.

Figure B.2: Removing the Top Screws

3. Put the HDD into the HDD bracket and fasten the screws..

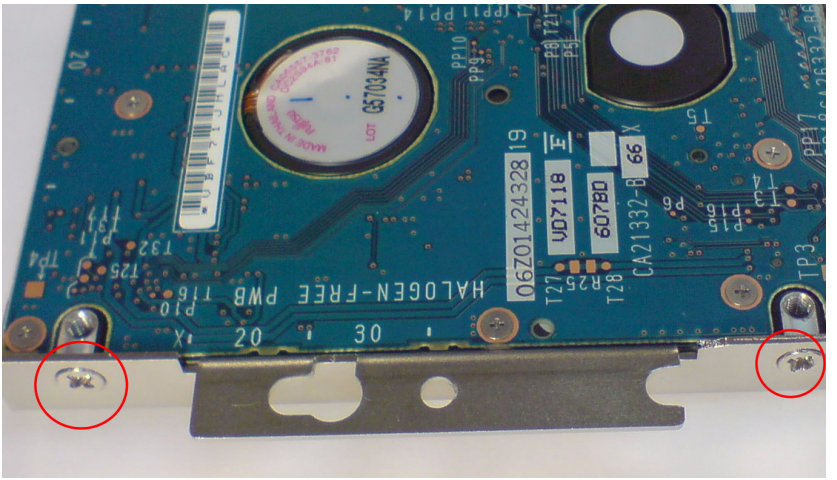


Figure B.3: Installing the HDD

4. Paste the Mylar (from assembly box)

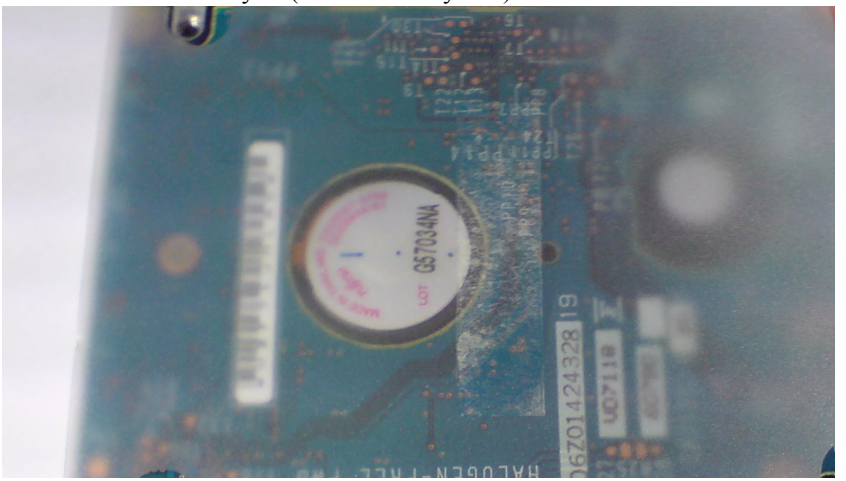


Figure B.4: Pasting the Mylar

5. Put the HDD to the system and fasten the screws.

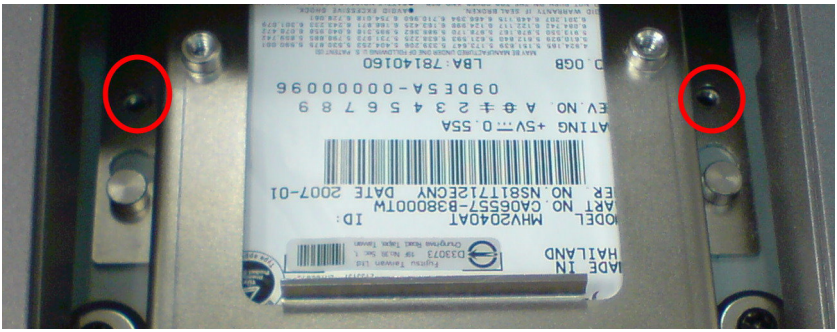


Figure B.5: Attaching the HDD

6. Re-attach the rear cover and fasten the screws.

   The HDD has been installed successfully.

APPENDIX C

Fuse Specifications

Appendix C Fuse Specifications

C.1 Fuse Specifications

Rating: 250VAC, 5Amp

Size: 5 x 20mm

Note	*The fuse is set to break as the input voltage exceeds 33VDC for your protection.*

C.2 Fuse Replacement

Step 1: Remove the fuse cover

Step 2: Replace the damaged fuse with a new one

Step 3: Place the fuse cover back in position

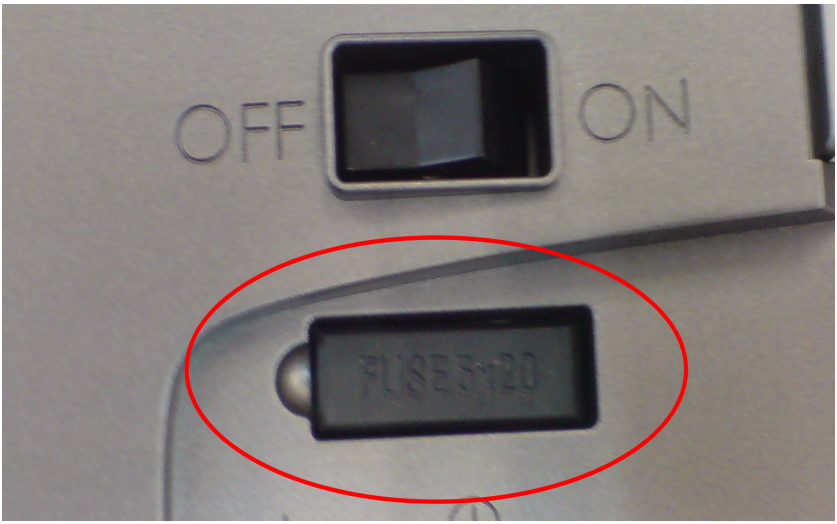


Figure C.1: Fuse Replacement

Warning	*Do NOT replace the fuse unless it is damaged.* *Do NOT replace the fuse with a different rating.*